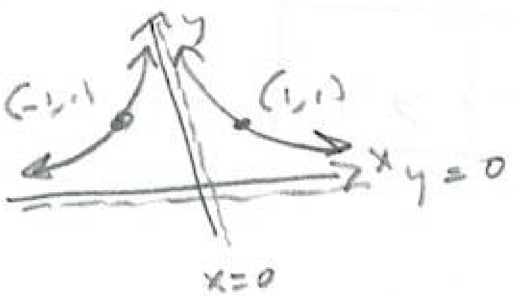
121 Writing Project ~~#2~~

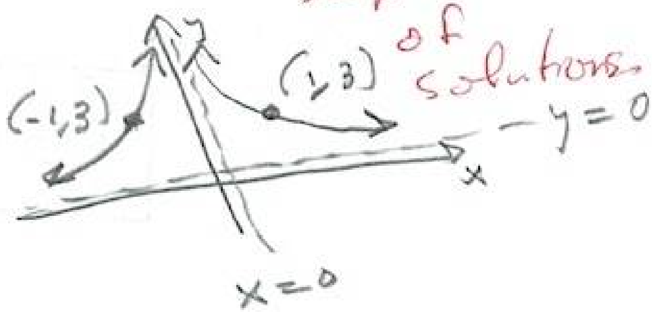
THIS IS ALL METHOD #1. FOR METHOD 2, skip to end of solutions.

(1) $g(x) = \dfrac{3}{(5x-15)^2} - 6$

(0) $f(x) = \dfrac{1}{x^2}$

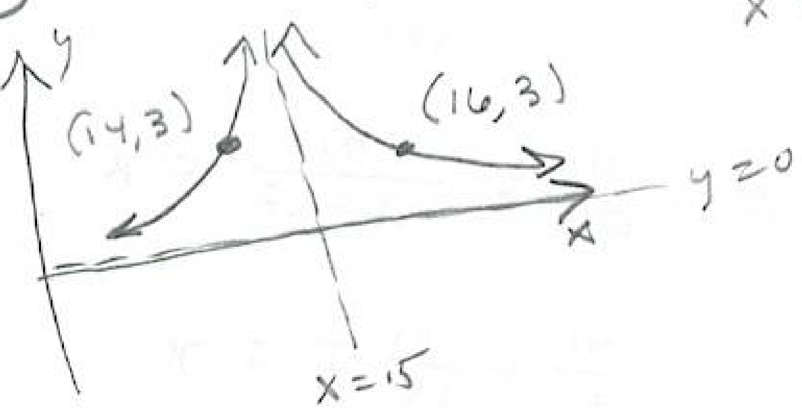


(1) $3f(x) = \dfrac{3}{x^2}$



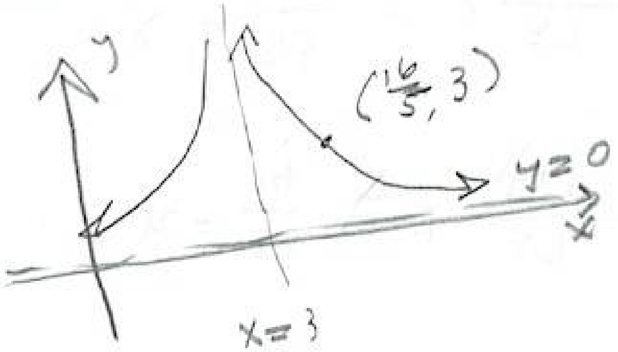
(2) $3f(x-15) = \dfrac{3}{(x-15)^2}$

$x \longmapsto x+15$

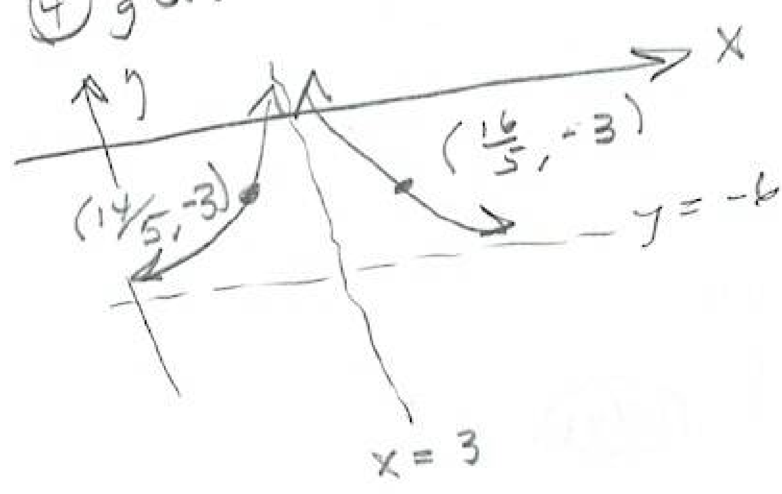


(3) $3f(5x-15) = \dfrac{3}{(5x-15)^2}$

$x \longmapsto \frac{1}{5}x$

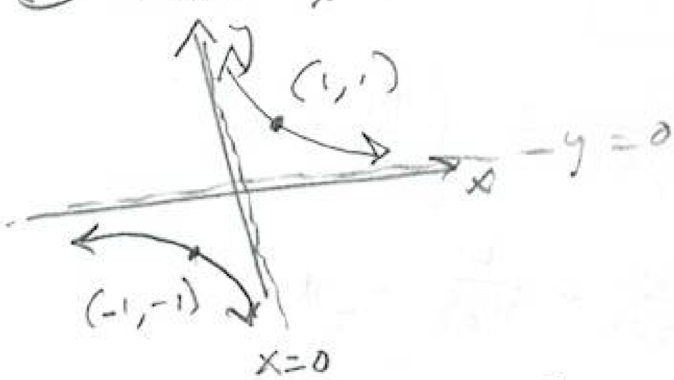


(4) $g(x)$



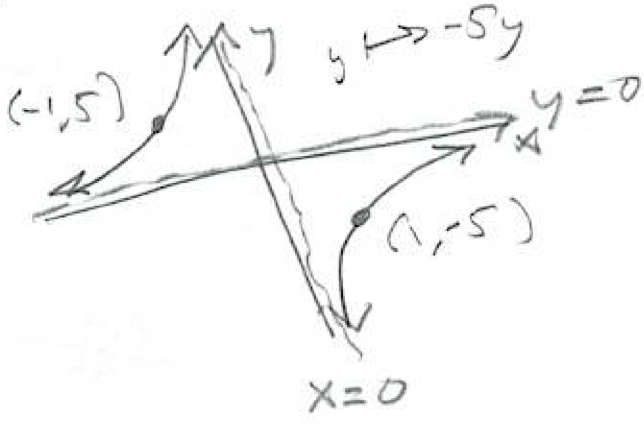
(2) $g(x) = \dfrac{-5}{(2x+14)} + 3$

(0) $f(x) = \dfrac{1}{x}$



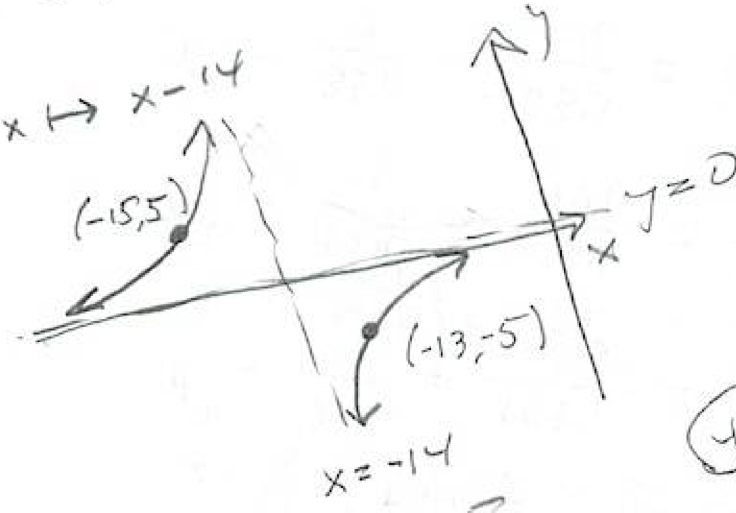
(1) $-5f(x) = \dfrac{-5}{x}$

$y \mapsto -5y$



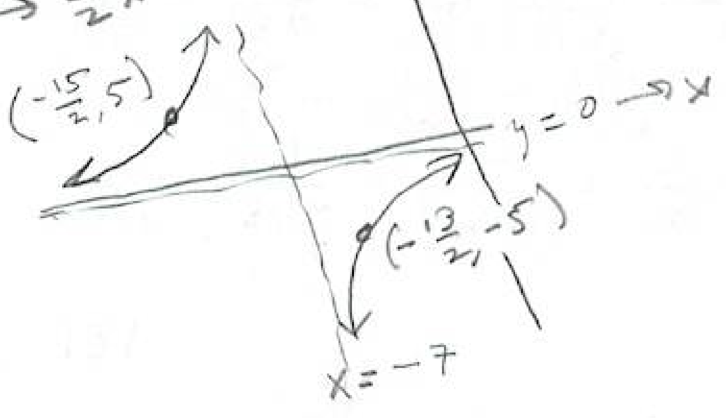
(2) $-5f(x+14) = \dfrac{-5}{x+14}$

$x \mapsto x-14$



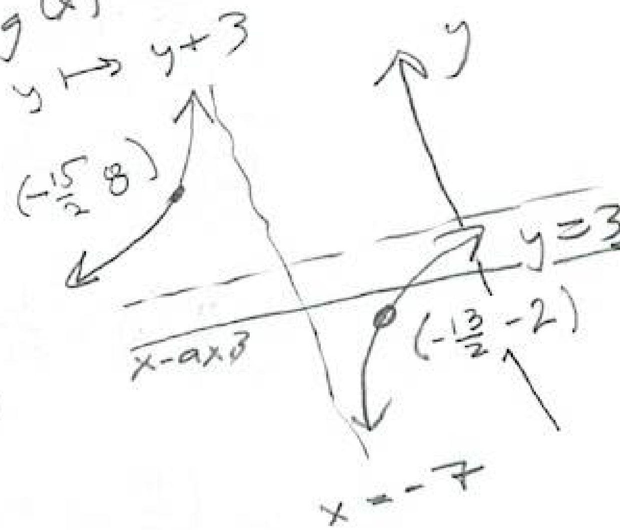
(3) $-5f(2x+14) = \dfrac{-5}{(2x+4)}$

$x \mapsto \frac{1}{2}x$



(4) $g(x)$

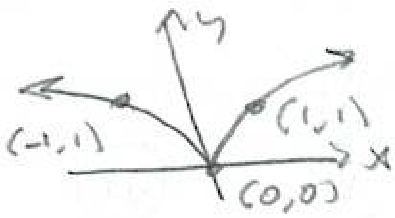
$y \mapsto y+3$



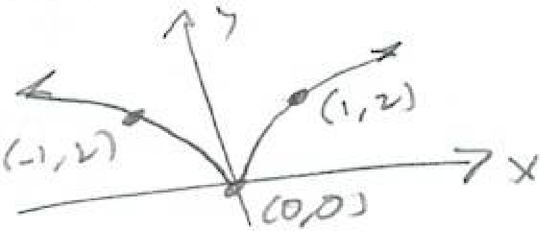
121 wp #2 (3)

(3) $g(x) = 2(3x-12)^{2/3} - 5$

(0) $f(x) = x^{2/3}$

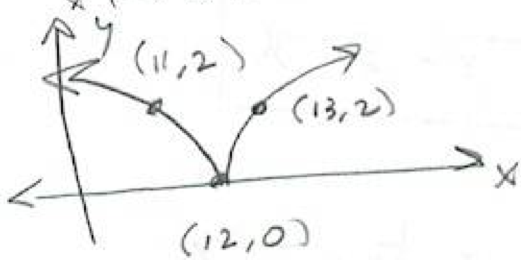


(1) $2f(x) = 2x^{\frac{2}{3}}$ $y \mapsto 2y$



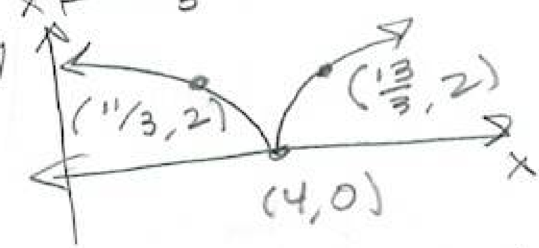
(2) $2f(x-12) = 2(x-12)^{2/3}$

$x \mapsto x+12$

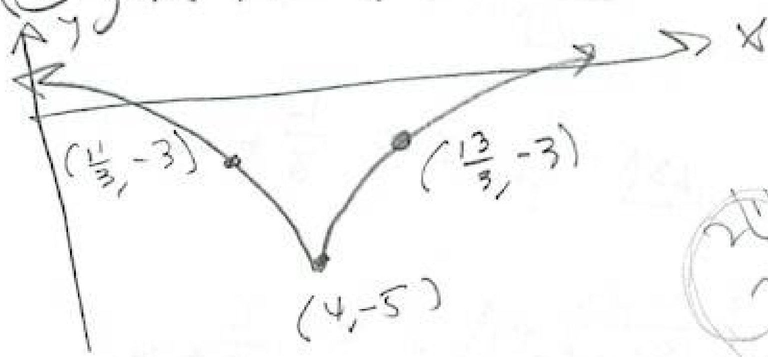


(3) $2f(3x-12) = 2(3x-12)^{2/3}$

$x \mapsto \frac{1}{3}x$



(4) $g(x)$ $y \mapsto y-5$



You could just plug in $g(0)$

$= 2(-12)^{2/3} - 5$

$= 2*(12)\wedge(2/3) - 5$

$\approx 5.482965577 > 0$

Check fussy bits 2

$g(0) = 2(-12)^{2/3} - 5$

$= 2\sqrt[3]{144} - 5$

$= 2 \cdot 2\sqrt[3]{18} - 5$

$2^3 = 8,\ 3^3 = 27$

$2 \,|\, 144$
$2 \,|\, 72$
$2 \,|\, 36$
$2 \,|\, 18$
$3 \,|\, 9$
3

so $\sqrt[3]{18} > 2$, so $2 \cdot 2\sqrt[3]{18} = 4\sqrt[3]{18} > 4 \cdot 2 = 8$

$\Rightarrow g(0) > 8 - 5 = 3 > 0$,

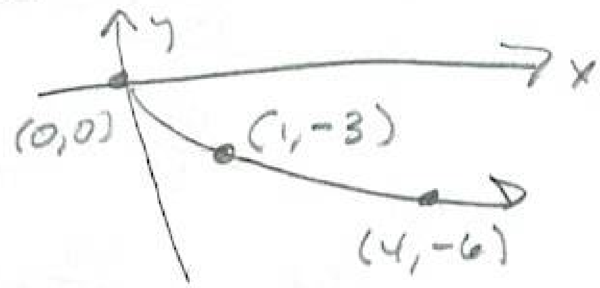
so y-int is above x-axis

121 WP#2 4

(4) $g(x) = -3\sqrt{4x+20} + 7$

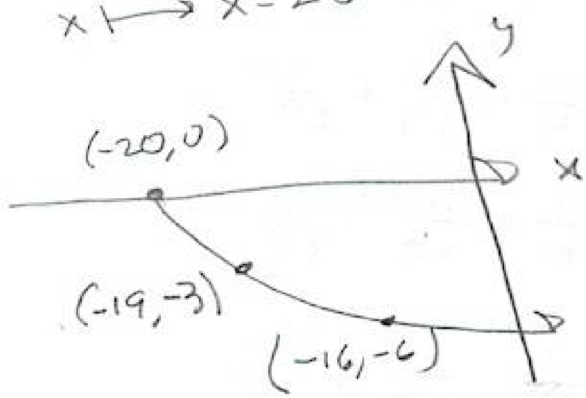
(0) $f(x) = \sqrt{x}$

(1) $-3f(x) = -3\sqrt{x}$ $y \mapsto -3y$



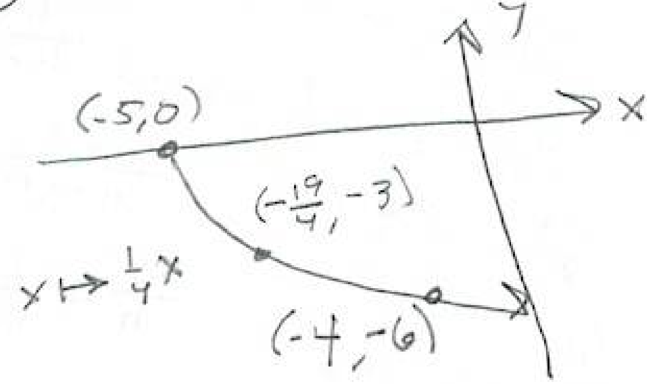
(2) $-3f(x+20) = -3\sqrt{x+20}$

$x \mapsto x-20$

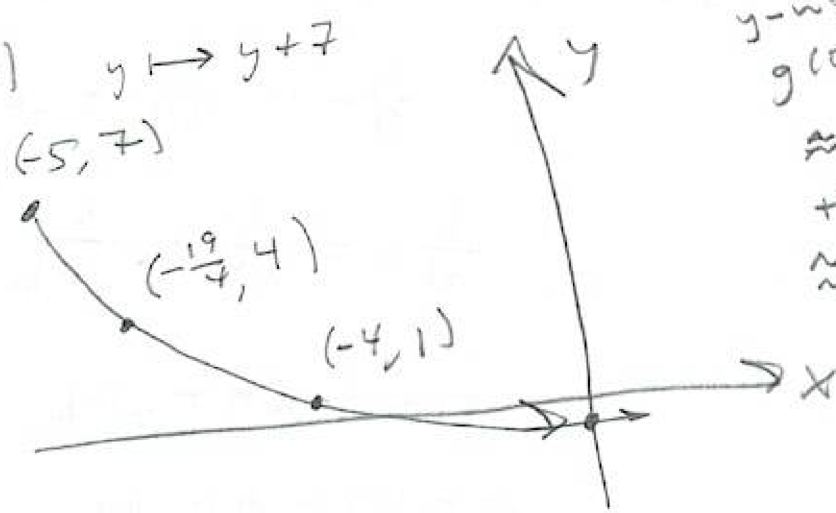


(3) $-3f(4x+20) = -3\sqrt{4x+20}$

$x \mapsto \frac{1}{4}x$



(4) $g(x)$ $y \mapsto y+7$

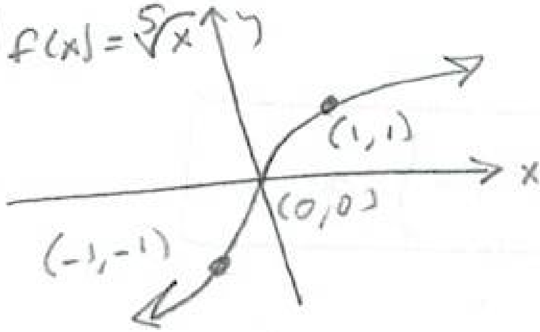


y-int:
$g(0) = -3\sqrt{20} + 7$
$\approx -3(4.472135955)$
$+7$
≈ -6.416407865
y-int BELOW
x-axis

3) $g(x) = 4\sqrt[5]{3x+12} - 7$ $\sqrt[5]{x} = x^{\frac{1}{5}}$

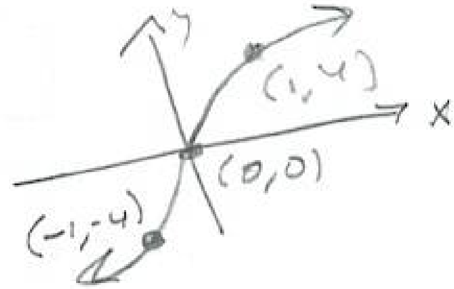
has $\sqrt[3]{x}$ shape.

0) $f(x) = \sqrt[5]{x}$



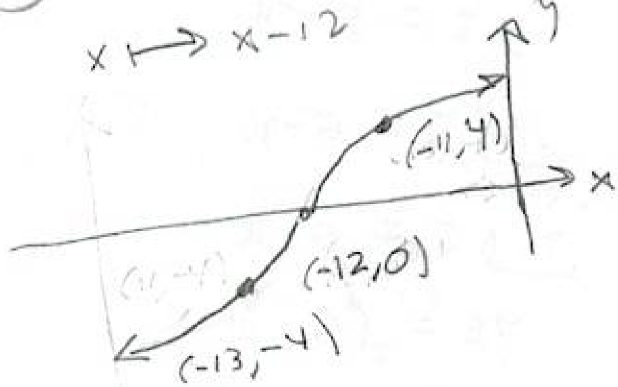
1) $4f(x) = 4\sqrt[5]{x}$

$y \mapsto 4y$



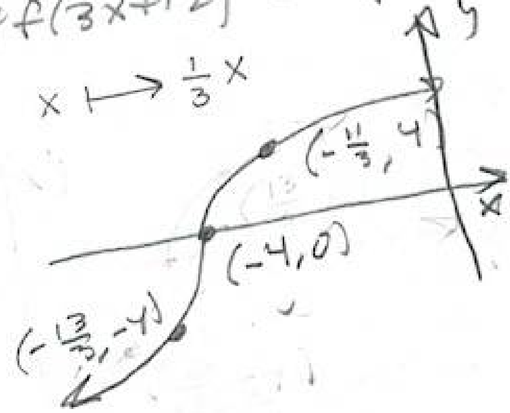
2) $4f(x+12) = 4\sqrt[5]{x+12}$

$x \mapsto x - 12$

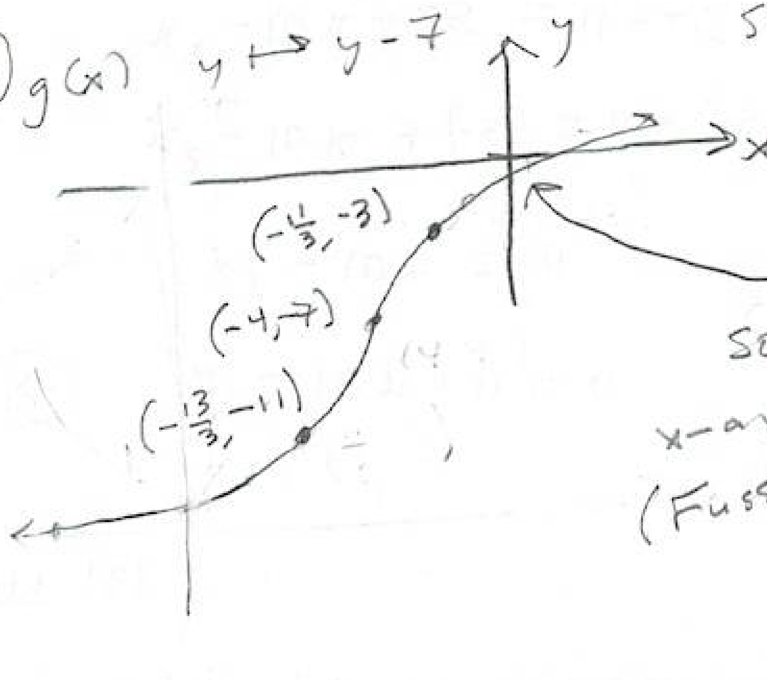


3) $4f(3x+12) = 4\sqrt[5]{3x+12}$

$x \mapsto \frac{1}{3}x$



4) $g(x)$ $y \mapsto y - 7$



small detail:

$g(0) = 4\sqrt[5]{12} - 7$

$\approx 6.575007318 - 7$

$\approx -.424992681 9$

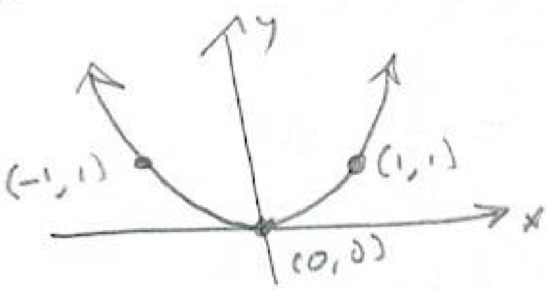
so y-int. is below

x-axis.

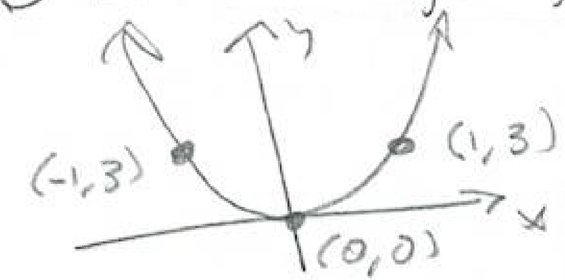
(Fussy Bits)

6 $g(x) = 3(3x-6)^4 - 2$

0 $f(x) = x^4$ has x^2 shape

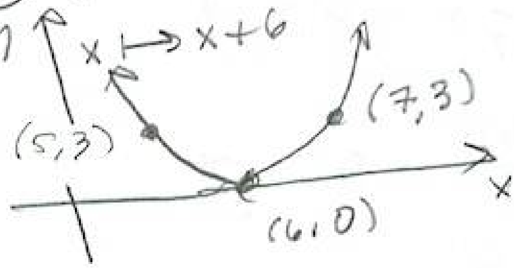


1 $3f(x) = 3x^4$ $y \mapsto 3y$



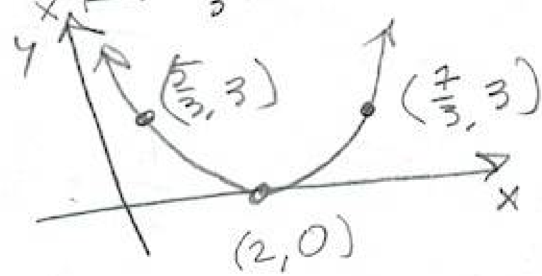
2 $3f(x-6) = 3(x-6)^4$

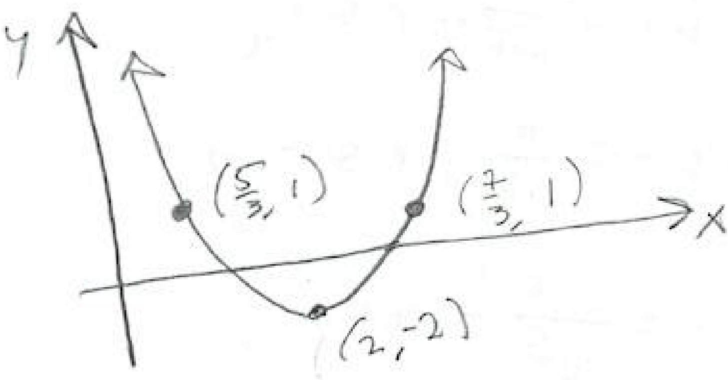
$x \mapsto x+6$



3 $3f(3x-6) = 3(3x-6)^4$

$x \mapsto \frac{1}{3}x$





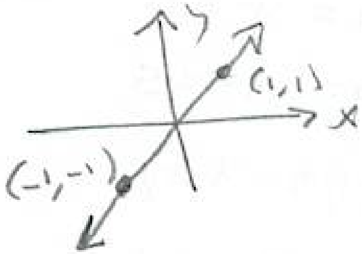
I didn't show the y-int, which is way up there @ $y = 3(6)^4 - 2 = $ BIG.

$g(x)$

$y \mapsto y-2$

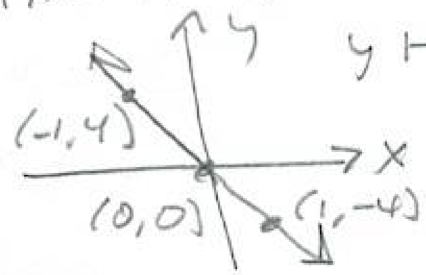
7. $g(x) = -4(x+3)+5$

0. $f(x) = x$



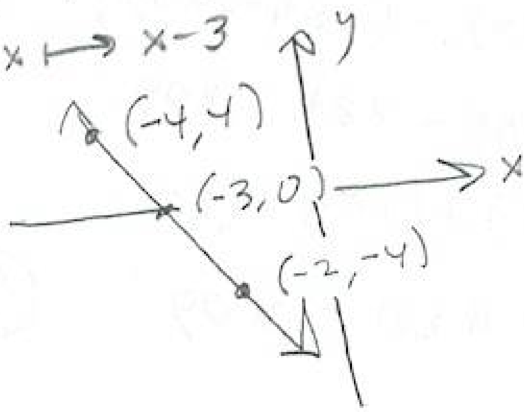
1. $-4x = -4f(x)$

$y \mapsto -4y$

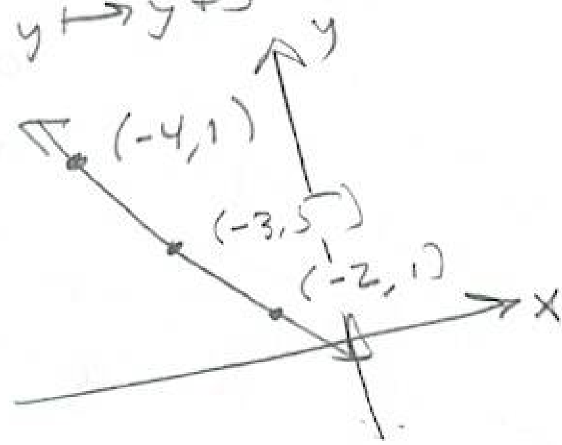


2. $-4f(x+3)$

$x \mapsto x-3$

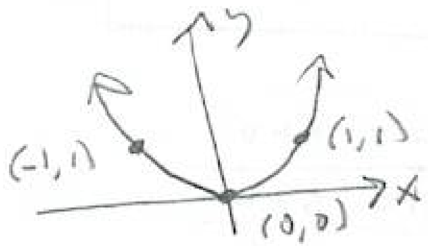


3. $g(x)$ $y \mapsto y+5$



8. $g(x) = -5(x+3)^2+2$

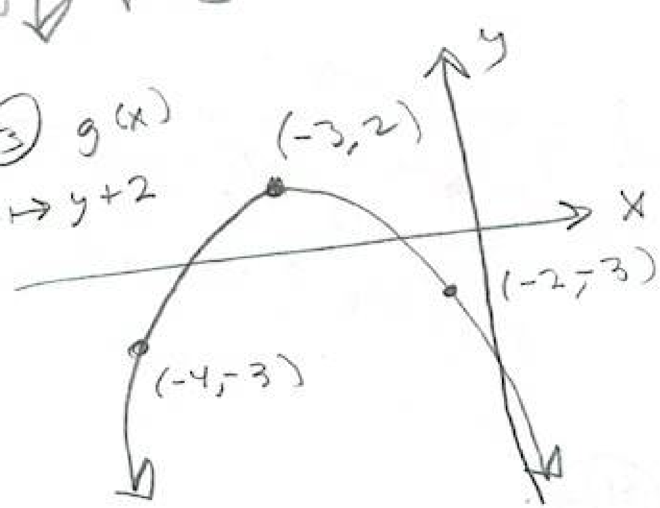
0. $f(x) = x^2$



1. $-5f(x) = -5x^2$ $y \mapsto -5x^2$

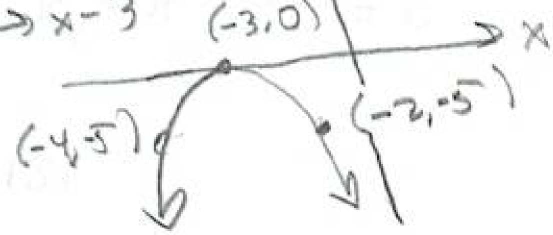
3. $g(x)$

$y \mapsto y+2$



2. $-5(x+3)^2 = -5f(x+3)$

$x \mapsto x-3$



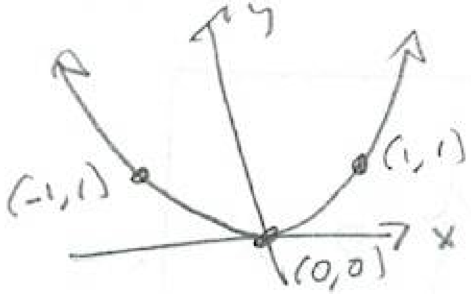
121 wp #2

9 $g(x) = x^2 - 4x - 10$

$= x^2 - 4x + 2^2 - 4 - 10$

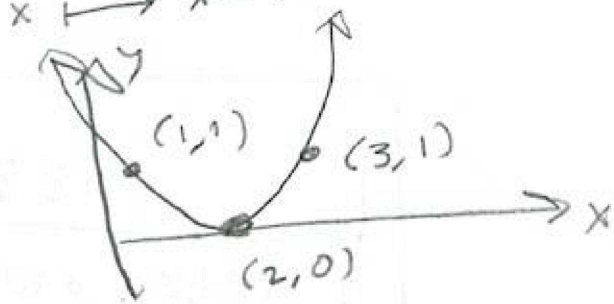
$= (x-2)^2 - 14$

0 $f(x) = x^2$



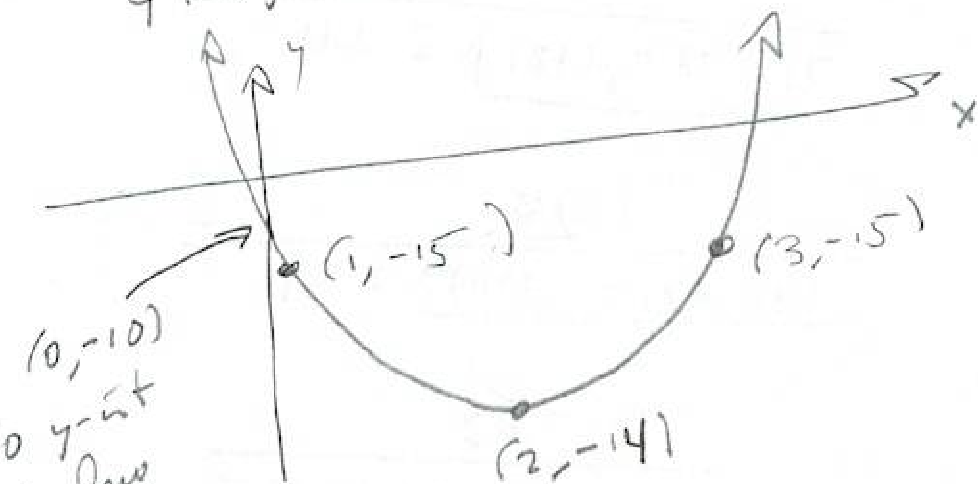
1 $(x-2)^2 = f(x-2)$

$x \longmapsto x+2$



2 $g(x) = (x-2)^2 - 16$

$y \longmapsto y - 16$



so y-int is <u>below</u> x-axis

121 WP #2 9

$g(x) = 7x^2 - 11x + 5 \Longrightarrow$

$7 \overline{)196}$ 28

$\frac{1}{7} g(x) = x^2 - \frac{11}{7}x + \frac{5}{7}$

$= x^2 - \frac{11}{7}x + \left(\frac{11}{14}\right)^2 - \frac{121}{196} + \frac{5}{7} \cdot \frac{28}{28}$

Scratch:

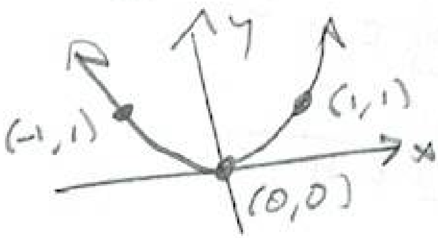
$\frac{-121 + 140}{196}$

$= \frac{19}{196}$

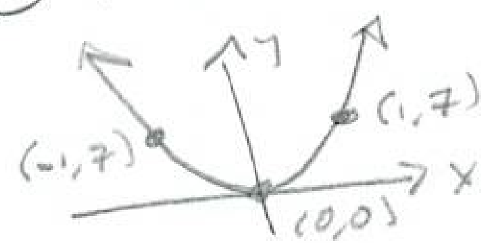
$= \left(x - \frac{11}{4}\right)^2 + \frac{19}{196} \Longrightarrow$

$\boxed{g(x) = 7\left(x - \frac{11}{4}\right)^2 + \frac{19}{28}}$

0 $f(x) = x^2$

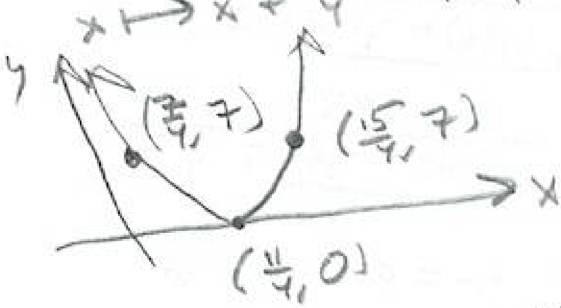


1 $7f(x) = 7x^2$



2 $7f\left(x - \frac{11}{4}\right) = 7\left(x - \frac{11}{4}\right)^2$

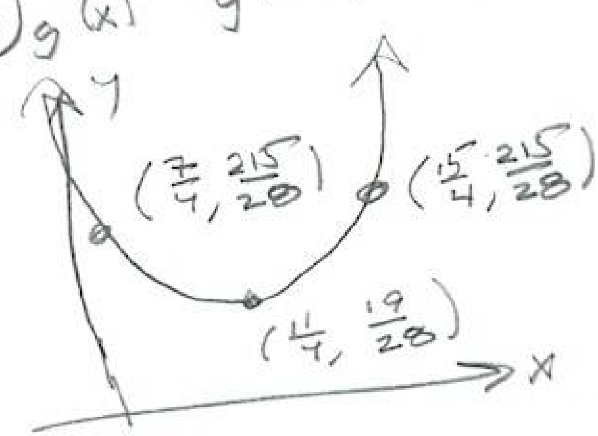
$x \longmapsto x + \frac{11}{4}$ $1 + \frac{11}{4} = \frac{15}{4}$



$7 + \frac{19}{28} = \frac{196 + 19}{28}$

$= \frac{215}{28}$

3 $g(x)$ $y \longmapsto y + \frac{19}{28}$



121 WP #2 METHOD 2 Version

We show steps 2 & 3 only:

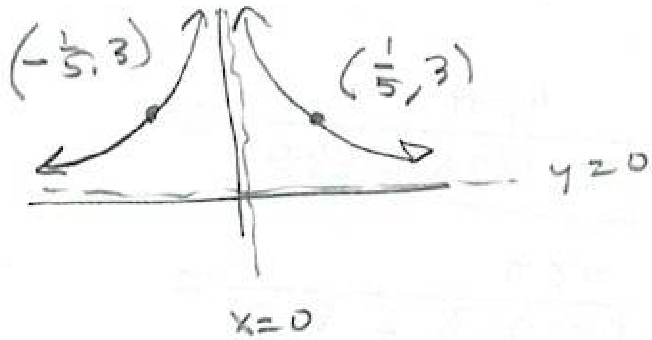
$\boxed{\text{NOTE}}$ step 3 is the same, you just arrive at it, differently.

1) $g(x) = \dfrac{3}{(5x-15)^2} - 6$

0) $f(x) = \dfrac{1}{x^2}$ 1) $3f(x) = \dfrac{3}{x^2}$

2) $3f(5x) = \dfrac{3}{(5x)^2}$

$x \mapsto \frac{1}{5}x$



3) $3f(5(x-3)) = \dfrac{3}{(5(x-3))^2}$

$x \mapsto x+3$

$-\frac{1}{5} + 3(\frac{5}{5}) = \frac{14}{5}$

$\frac{1}{5} + 3(\frac{5}{5}) = \frac{16}{5}$

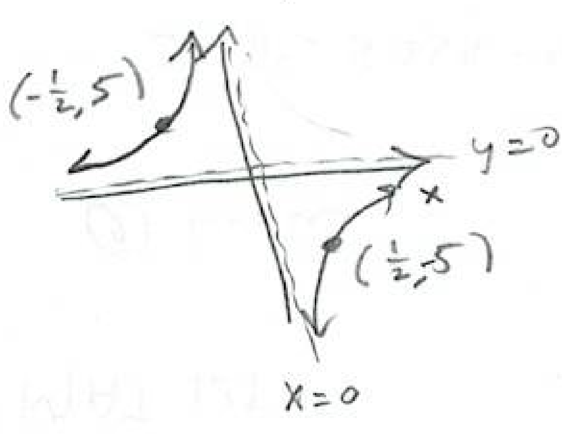
2) $g(x) = \dfrac{-5}{2x+14} + 3$

$= \dfrac{-5}{2(x+7)} + 3$

0) $f(x) = \dfrac{1}{x}$, 1) $-5f(x) = \dfrac{-5}{x}$

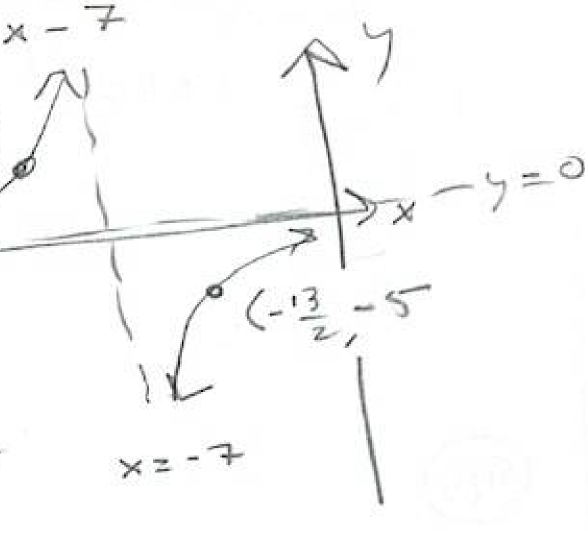
2) $-5f(2x) = \dfrac{-5}{2x}$

$x \mapsto \frac{1}{2}x$



3) $-5f(2(x+7)) = \dfrac{-5}{2(x+7)}$

$x \mapsto x-7$



$-\frac{1}{2} - 7 = -\frac{15}{2}$

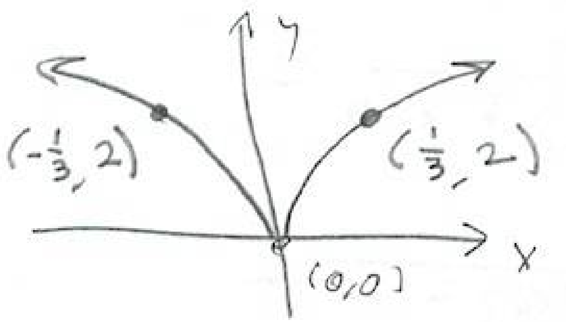
$+\frac{1}{2} - 7 = -\frac{13}{2}$

(3) $g(x) = 2(3x-12)^{\frac{2}{3}} - 5 = 2(3(x-4))^{\frac{2}{3}} - 5$

(0) $f(x) = x^{\frac{2}{3}}$, (1) $-2f(x) = 2x^{\frac{2}{3}}$

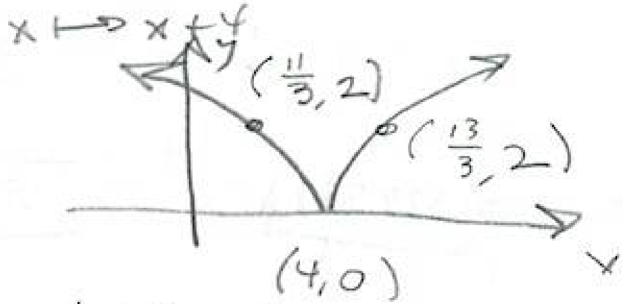
(2) $2f(3x) = 2(3x)^{\frac{2}{3}}$

$x \longmapsto \frac{1}{3}x$



(3) $2f(3(x-4)) = 2(3(x-4))^{\frac{2}{3}}$

$x \longmapsto x+4$



$-\frac{1}{3} + 4 = \frac{11}{3}$

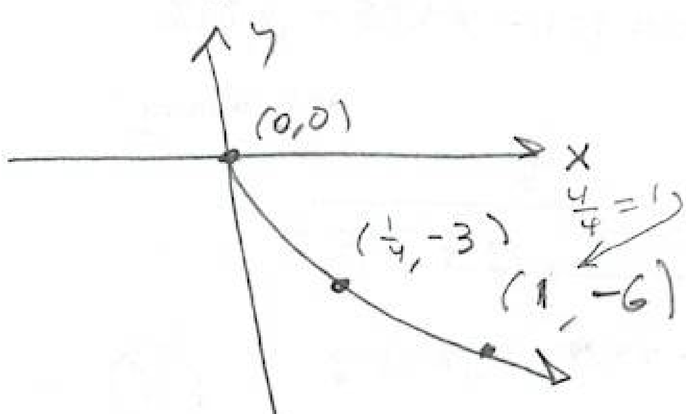
$\frac{1}{3} + 4 = \frac{13}{3}$

(4) $g(x) = -3\sqrt{4x+20} + 7 = -3\sqrt{4(x+5)} + 7$

(0) $f(x) = \sqrt{x}$ (1) $-3f(x) = -3\sqrt{x}$

(2) $-3f(4x) = -3\sqrt{4x}$

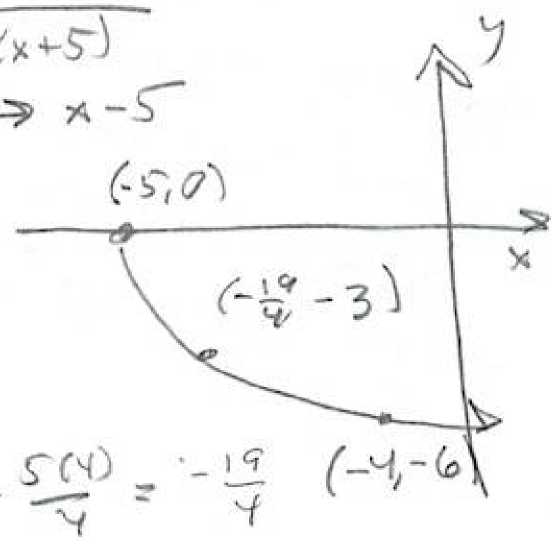
$x \longmapsto \frac{1}{4}x$



(3) $-3f(4(x+5))$

$= -3\sqrt{4(x+5)}$

$x \longmapsto x-5$



$\frac{1}{4} - \frac{5(4)}{4} = -\frac{19}{4}$

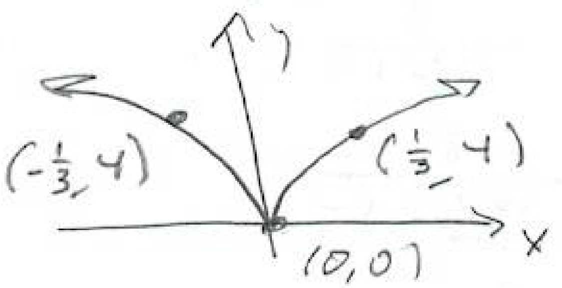
$1 - 5 = -4$

(5) $g(x) = 4\sqrt[5]{3x+12} + 7 = 4\sqrt[5]{3(x+4)} + 7$

(0) $f(x) = \sqrt[5]{x} = x^{\frac{1}{5}}$ (1) $4f(x) = 4\sqrt[5]{x}$

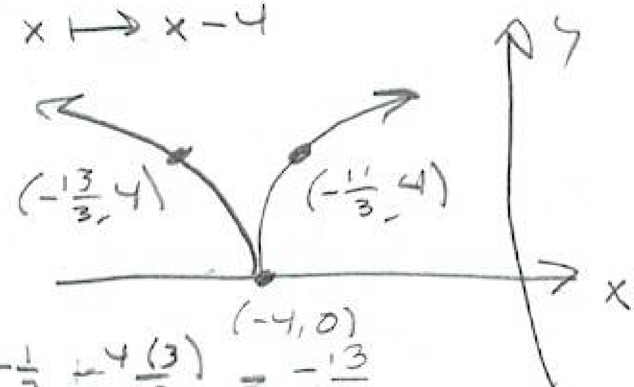
(2) $4f(3x) = 4\sqrt[5]{3x}$

$x \mapsto \frac{1}{3}x$



(3) $4f(3(x+4)) = 4\sqrt[5]{3(x+4)}$

$x \mapsto x-4$



$-\frac{1}{3} - 4\frac{(3)}{3} = -\frac{13}{3}$

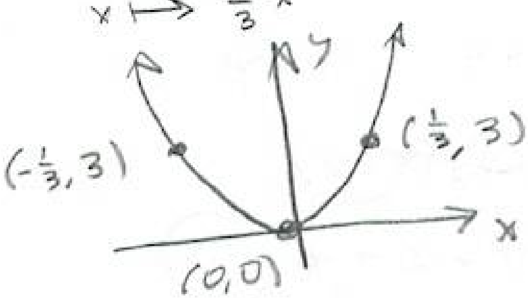
$\frac{1}{3} - \frac{12}{3} = -\frac{11}{3}$

(6) $g(x) = 3(3x-6)^4 - 2$
$= 3(3(x-2))^4 - 2$

(0) $f(x) = x^4$, (1) $3f(x) = 3x^4$

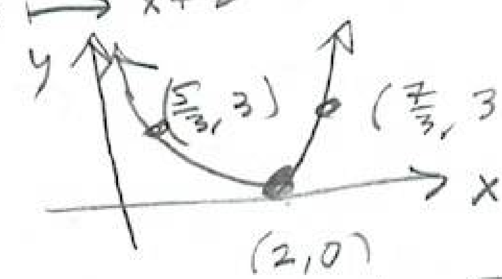
(2) $3f(3x) = 3(3x)^4$

$x \mapsto \frac{1}{3}x$



(3) $3f(3(x-2)) = 3(3(x-2))^4$

$x \mapsto x+2$



$-\frac{1}{3} + 2 = \frac{-1+6}{3} = \frac{5}{3}$

$\frac{1}{3} + 2 = \frac{7}{3}$